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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/635,606	08/10/2000	John C. Kralik	6536-118	7149

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EXAMINER	
DUONG, THOI V	

ART UNIT	PAPER NUMBER
2871	

DATE MAILED: 12/19/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/635,606	KRALIK, JOHN C.	
	Examiner	Art Unit	
	Thoi V Duong	2871	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *03* MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *25 August 2003*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,2 and 4-24* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2 and 4-24* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

13)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

a) ☐ The translation of the foreign language provisional application has been received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.
4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

1. This office action is in response to the Amendment filed August 25, 2003.

Accordingly, claims 1, 4, 11, 14, 15, 23 and 24 were amended, and claims 3 and 25 were cancelled. Currently, claims 1, 2 and 4-24 are pending in this application.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1, 2, 4-6, and 14-17 stand rejected under 35 U.S.C. 102(b) as being anticipated by Yamada et al. (USPN 5,668,651).

As shown in Figs. 1A and 1B, Yamada discloses a method of fabricating a liquid crystal display (LCD) device, comprising the steps of:

providing a nematic liquid crystal 20 (col. 14, lines 47-53);

providing a photo-curable pre-polymer mixture 27;

mixing said nematic liquid crystal with said photo-curable pre-polymer mixture to form a homogeneous nematic/pre-polymer mixture (col. 12, lines 30-37), with said nematic liquid crystal being greater than 40% (by weight) of said combined homogeneous mixture (col. 15, lines 53-56);

providing a cell comprising a pair of spaced apart transparent substrates 12, 13 that are each coated with a transparent conductive layer 14, 16;

filling said cell with said homogeneous nematic/pre-polymer mixture (col. 9, lines 18-21); and

photo-curing said nematic/pre-polymer mixture using a spatially inhomogeneous illumination source thereby creating the electrooptic device in the form of a polymer dispersed liquid crystal (PDLC) exhibiting low scattering loss and high index modulation (col. 9, line 61 to col. 10, line 17 and col. 15, lines 11-30),

wherein said nematic liquid crystal possesses a positive dielectric anisotropy (col. 13, lines 54-59);

wherein said nematic liquid crystal is a eutectic mixture (liquid crystal material E7 manufactured by Merck & Co., Inc.) (col. 18, lines 24-25);

wherein said substrates are separated approximately 7 micrometers by spacers having a particle size of 7 micrometers (col. 20, lines 63-65);

wherein said PDLC is comprised of a dispersion of discrete droplets containing nematic liquid crystal-rich material in a polymer-rich matrix (Figs. 1A and 1B); and

wherein said PDLC is comprised of regions of inter-connected spaces that are filled with nematic liquid crystal-rich material (Figs. 1A and 1B).

Finally, with respect to claim 1, the liquid crystal display device of Yamada et al. can be used as an electrooptical device or the like (col. 23, lines 16-27 and col. 24, lines 28-37). On the other hand, with respect to claim 14, USPN 6,339,486 B1 of Popovich et al. discloses that the liquid crystal can be used as a static optical device (col. 17, lines 52 through col. 18, line 10). It has been held that a recitation with respect to the manner in which a claimed status is intended to be employed does not differentiate the claimed

apparatus from a prior art apparatus satisfying the claimed structural limitations. Ex Parte Masham, 2 USPQ F.2d 1647 (1987).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 7-9 and 18-20 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Yamada et al. (USPN 5,668,651) as applied to claims 1, 2, 4-6, and 14-17 above in view of Sumiyoshi et al. (USPN 6,278,506 B1).

Yamada et al. discloses a method of fabricating a liquid crystal device that is basically the same as that recited in claims 7-9 and 18-20 except for the step of deriving said spatially inhomogeneous illumination source used to photo-cure the nematic/pre-polymer mixture from the interference of two coherent optical beams within said cell. As shown in Figs. 5A-5C, Sumiyoshi et al. discloses a method of fabricating a liquid crystal cell (Fig. 5A) comprising the step of deriving a spatially inhomogeneous illumination source 16 used to photo-cure a nematic/pre-polymer mixture 15a (col. 11, lines 40-45) from the interference of coherent optical beams LB11 and LB12 within the cell (col. 6, lines 30-51) to produce a plurality of phase gratings for increasing the intensity of transmission light (col. 7, lines 52-56). Accordingly, it is obvious that the coherent optical beams each have a wavelength in the ultraviolet spectrum for radiating the photo-curable polymer. Fig. 18 shows the incident angle AGL1 and the azimuth angle AGL2 of

the beams wherein AGL1 of the beam LB12 is fixed to zero by regulating the reflecting mirrors 16d and 16e while the beam LB11 is incident with a certain incident angle AGL1 to produce a first multilayer structure for the mixture. Further, a second multiplayer structure is created in the mixture by changing the reflecting mirror 16c in such a manner as to maintain the incident angle AGL1 and changing the incident azimuth AGL2 by 180 degrees for the beam LB11. Accordingly, an unslanted PDLC transmission grating will result when the interfering optical beams LB11 are incident symmetrically about a direction normal to said cell (col. 10, lines 15-48). Also, as shown in Fig. 8, Sumiyoshi et al. discloses that the nematic liquid crystal in the nematic-rich regions in the PDLC contains a high degree of orientational order and has its nematic director substantially aligned along a uniform orientation OR2 in a grating layer 15f when no drive field is applied across said cell. Since the grating layer is unslanted, its grating vector is parallel to the grating surface. Thus, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the method of fabricating a LCD device of Yamada et al. with the teaching of Sumiyoshi et al. by employing two interfering optical beams which are incident symmetrically about a direction normal to said cell in order to form said PDLC as an unslanted PDLC transmission grating so as to produce a highly bright image for the display.

6. Claims 10-13 and 21-24 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Yamada et al. (USPN 5,668,651) in view of Sumiyoshi et al. (USPN 6,278,506 B1) as applied to claims 7-9 and 18-20 above and further in view of Popovich et al. (USPN 6,339,486 B1).

The liquid crystal device of Yamada et al. as modified in view of Popovich et al. above includes all that is recited in claims 10-13 and 21-24 except for a grating period that is greater than half the wavelength of the light to be diffracted by the PDLC transmission grating during use of said transmission grating and a spatial frequency that is sufficiently high to prohibit propagating diffracted orders for normal incident light, thereby creating an electrooptic retarder with electrical tunable birefringence. As shown in Fig. 13, Popovich et al. discloses a transmission grating 200 having periodic planes of polymer planes 200a and PDFC plane 200b wherein each polymer plane has a thickness t(P) and each PDLC plane has a thickness t(PDLC), and the combined thickness of the PDLC plane and the polymer plane is a grating period which is less than an incident optical wavelength to exhibit form birefringence (col. 15, lines 1-4 and col. 17, lines 1-10). Accordingly, the grating period can be selected to be greater than half the wavelength of the light to be diffracted by the PDFC transmission grating during use of said transmission grating. Popovich et al. also discloses the transmission grating with a spatial frequency that is sufficiently high to prohibit propagating diffracted orders for normal incident light, thereby creating an electrooptic retarder with electrically tunable birefringence (col. 9, line 64 through col. 10, lines 7; and col. 15, lines 1-15). Similarily, Popovich et al. discloses that a high birefringent static sub-wavelength wave-plate can also be formed.

Thus, it would have been obvious to one having ordinary skill in the art at the time the invention was made to further modify the device of Yamada et al. with the teaching of Popovich et al. by forming the unslanted PDLC transmission grating with a

grating period that is greater than half the wavelength of the light to be diffracted by the PDLC transmission grating during use of said transmission grating or a spatial frequency that is sufficiently high to prohibit propagating diffracted orders for normal incident light, thereby creating an electrooptic retarder with electrically tunable birefringence or a retarder so as to improve the display brightness.

Response to Arguments

7. Applicant's arguments filed 08/25/2003 have been fully considered but they are not persuasive.

With respect to claims 1-6, 14-17 and 25, Applicant argued that the Examiner fails to discuss the eutectic mixture of claims 3 and 25. The Examiner disagrees with the Applicant's remarks because Yamada discloses that a nematic liquid crystal material E7 manufactured by Merck & Co., Inc. is used in the method for producing the liquid crystal device (col. 18, lines 24-25). As known in the art, E7 is a eutectic mixture (see USPN 5,448,382 of Land et al., col. 4, lines 50-66).

Applicant also argued that Yamada includes a polymerizable LC component in his mixtures, utilizes an alignment layer to align the nematic content, and cures his displays in an aligned state; meanwhile, in the present invention, the polymerizable nematic material are not used, and alignment treatment on the substrates is not required.

Applicant further argued that Yamada uses spatially inhomogeneous UV radiation to "effect a photo-polymerization" at "a temperature equal to or higher than the homogenization temperature of the mixture and describes the contrast of his displays in

simple scalar terms; in contrast, the present invention would not work under elevated temperatures and does not utilize an electric or magnetic field during photo-curing, and requires a tensor approach for proper description of contrast.

The Examiner recognizes each and every element articulated above; however, the reference of Yamada still meets all limitations recited in the claims.

Applicant also argued that the Examiner states "filling said cell" while Yamada "injects". Actually, Yamada "injects" the LC mixture for "filling said cell".

Applicant also argued that the modifier "approximately" doesn't appear in Yamada in the Examiner's statement "wherein said substrates are separated by approximately 7 micrometers". However, the modifier "approximately" for spacing the two substrates is appropriate since, according to Yamada, the size of the spacers injected between the two substrates is 7 micrometers. In addition, this approximate spacing of 7 micrometers still meet the new limitation "from about 5-6 micrometers to about 8-20 micrometers" recited in claims 4 and 15.

With respect to claim 14, Applicant argued that Popovich describes static optical components that are not PDLC materials. The Examiner disagrees with the Applicant's remarks since Popovich clearly discloses a liquid crystal E7 which is a nematic liquid crystal material with eutectic mixture as explained above (col. 17, lines 52-67).

With respect to claims 7-9 and 18-20, the reference of Sumiyoshi et al. is employed for teaching the step of using a spatially inhomogeneous illumination to photo-cure a nematic/prepolymer mixture to produce a plurality of phase gratings for increasing the intensity of transmission light. It is applicable to the LCD device of

Yamada for forming the phase gratings shown as item 27 in Fig. 1B of Yamada to produce a highly bright image for the display.

Similarily, with respect to claims 10-13 and 21-24, the reference of Popovich et al. is employed for teaching an unslanted PDLC transmission grating with a grating period greater than half the wavelength of the light to be diffracted by the PDLC transmission grating during the use of said transmission grating or a spatial frequency that is sufficiently high to prohibit propagating diffracted orders for normal incident light, thereby creating an electrooptic retarder with electrically tunable birefringence or a retarder. It is applicable to the LCD device of Yamada for further improving the display brightness.

Conclusion

8. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thoi V. Duong whose telephone number is (703) 308-3171. The examiner can normally be reached on Monday-Friday from 8:00 am to 4:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Robert Kim, can be reached at (703) 305-3492.

Thoi Duong

12/13/2003

T. Chowdhury
Primary Examiner